

DETAILED ACTION

Summary

1. This is an initial Office Action based on US application 10/516,921 by FRANZ-JOSEF DIETZEN, GERD EHRMANN, BERNHARD SCHMIED, MARTIN LAUN, KLAUS HAHN, JOACHIM RUCH, MARKUS ALLMENDINGER, JAN HOLOCH and ACHIM DATKO filed on December 7, 2004. Claims 1-24 are currently pending and have been fully considered for examination.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 6, 16-18, and 22-24, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 6, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Regarding claim 17, the phrase "step f)" renders the claim indefinite because it is unclear whether the limitations following the phrase are referencing to independent claim 16 wherein "step f)" is included or claim 15 which is depended upon claim 1 and does not include "step f)" limitation. For purposes of examination, examiner is considering claim 17 dependent upon the limitations of claim 16.

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Regarding claims 16 -18, and 22-24, the phrase “if desired” as used in claim 16, steps a) and c) renders the claim indefinite. It is unclear whether the limitation steps following the phrase represent the invention; therefore it is unclear for examiner to determine which steps represent the invention and their configuration with each other. Claims 17, 18 and 22-24 are dependent upon the limitations as declared in claim 16, thus become unclear.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-5, 7-9,15 -24 are rejected under 35 U.S.C. 103(a) as being unpatentable over BIGILIONE et al. (US 4,606,873) in view of ZIMMERMANN et al. (US 5,112,875).

Regarding claim 1, BIGILIONE et al. teaches of a process for production of expandable granules of thermoplastic polymers like polystyrene wherein an expanding agent is incorporated with polystyrene polymer in an extrusion die-head with a temperature of about 160 degree Celsius (a process for the preparations of expandable styrene polymers which comprises conveying a blowing agent-containing styrene polymer melt having a temperature in the range from 140 to 300 degree Celsius) [Abstract; claim 1; claim 7; example 1: 33-35]. BIGILIONE teaches that the die head comprises several holes having a diameter that may vary between 0.5 and 4 mm [col.3, lines 55-56]. In example I, BIGILIONE discloses that the die head is provided with 20 holes, wherein each of the holes has a diameter of 0.7 mm (through a die plate with holes whose diameter at the die exit is at most 1.5 mm) [Example I, col.5, lines 32-36]. The polymer melt extruded from the die head was granulated into granules having a diameter about 1.2 mm (and subsequently granulating the extrudate) [Example I, col.5, lines 36-40]. The values of die holes diameter and temperature at which process was carried as taught by BIGILIONE are inclusive of the ranges as required in claim 1.

BIGILIONE et al. is silent to teach about the molecular weight of the expandable polystyrene polymer consisting of greater than 170,000 g/mol as requested in claim 1.

ZIMMERMANN et al. teaches of polystyrene polymer used in a process for production of expandable styrene polymers wherein the average molecular weight of polystyrene ranges of about 180,000 to about 300,000 g/mol [Abstract; col. 3, lines 8-21].

At the time of invention, it would have been obvious to one of ordinary skill in the art to use the polystyrene polymer with molecular weight of about 180,000 to about 300,000 g/mol as taught by ZIMMERMANN et al. in the process of preparing

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expandable polystyrene polymers as taught by BIGILIONE et al. in order to produce polystyrene granules from expandable styrene polymers with high degree of expandability due to the use of low level blowing or foaming agents used to make articles like seat cushions.

Regarding claim 2, the teachings as referenced in claim 1 apply.

Regarding claim 3, modified BIGILIONE in view of ZIMMERMANN teaches of a polydispersity of from about 1.0 to less than 2.5 [ZIMMERMANN, Abstract, col.3: 15-20]. The range is inclusive of the range of at most 3.5 as required.

Regarding claim 4, modified BIGILIONE teaches that the polymer used in the process is polystyrene which reads on the requirements of the claim. It would have been obvious to one of the ordinary skill to use different kinds of styrene containing polymers and copolymers in the process as taught by modified BIGILIONE in order to ensure the production of styrene granules with high expandability used to make articles like seat cushions.

Regarding claim 5, modified BIGILIONE teaches the blowing agent-containing styrene polymer melt comprises between 2 to 10% by weight of one or more blowing agents selected from the group of aliphatic hydrocarbons [col.1: 26-28, col.4: 7-11].

Regarding claim 7, the teachings as referenced in claim 1 apply.

Regarding claim 8, the teachings as referenced in claim 1 apply. It would have been obvious to one of ordinary skill in the art that the die head or plate would be heated at least to the temperature of the blowing agent-containing polystyrene melt, especially when the die head or plate is made of a metal type metal which has great heat transfer capabilities. In addition, if the die head or plate is at different temperature than the melt

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i.e. cooler, the melt may not be in molten state thus it would be difficult to extrude and exit the small diameter orifices as taught by modified BIGILIONE.

Regarding claim 9, the teachings as referenced in claim 1 apply.

Regarding claim 15, modified BIGILIONE teaches of expanded polystyrene particles produced by polymerizing styrene in aqueous suspension in the presence of blowing agents [ZIMMERMANN: col.2: 7-11]. It would have been obvious to one of ordinary skill in the art to determine and modify the amount of water in the polymer melt in order to the production of styrene granules with high expandability used to make articles like seat cushions.

Regarding claim 16, the teachings as referenced in claim 1 apply. Modified BIGILIONE is silent to point out step b) and that polymer melt was cooled to a temperature of 120 degree Celsius of step d). However, it would have been obvious to one of ordinary skill in the art to degas the resultant styrene polymer melt when polymerized in solution avoid formation of bubbles in the polymer melt in order to ensure formation of styrene granules with high expandability. In addition, it would have been obvious either cool or increase the temperature of the polymer melt once the additives are added so that one can control the temperature of the melt in order to facilitate the extrusion of the melt through the plurality of holes located on the die head or plate and to ensure production of styrene granules with high expandability characteristics.

Regarding claim 17, modified BIGILIONE teaches that cutting or granulation of polystyrene melt was performed in chamber 8 where water circulated at the pressure of 9 Bar (granulation of melt carried out directly behind the die plate under water at pressure in the range from 1 to 10 Bar) [Example I; col.5, lines 40-44].

Regarding claims 18-24, the teachings as referenced in claim 1 and 15 apply. Modified BIGILIONE teaches of expandable styrene polymer (EPS) as required. As per claim 18, it would have been obvious to one of ordinary skill in the art to adjust and modify the quantity of styrene monomer used in the process as taught by modified BIGILIONE to ensure production of styrene granules comprising a quality of high expandability.

Regarding claims 19-21, it would have been obvious to one of ordinary skill in the art to adjust and modify the content of water in the melt in order to produce an expandable styrene polymer with low water content to ensure high expandability of the product. In addition, modified BIGILIONE teaches that spheroidal granules with a diameter of about 1.2 mm (claim 22) [col.5, lines 39-40] with a density of 18g/l are produced (claim 23) [col.5, lines 57-59]. Modified BIGILIONE discloses that colored granules can be produced (claim 24) [col.1, lines 50-54]. It would have been obvious to optimize the amount of pigment used in the process as taught by modified BIGILIONE for aesthetic and appearance purposes as desired by one of ordinary skill in the art yet ensure production of granules comprising a quality of high expandability.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over BIGILIONE et al. (US 4,606,873) in view of ZIMMERMANN et al. (US 5,112,875) as applied to claims 1-5, 7-9, 15 -24 above, and further in view of CARMODY et al. (US 3,673,126).

Modified BIGILIONE teaches of a process for production of expandable granules of thermoplastic polymers like polystyrene as referenced in claim 1.

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Regarding claim 6, modified BIGILIONE et al. is silent to specifically teach the types of additives comprising plasticizers in proportions in the range from 0.05 to 10% by weight, based on styrene polymer as required.

CARMODY et al. teaches a process for production of expandable thermoplastic polymer compositions wherein a thermoplastic polymer, blowing agent and additive are used to make a melt [Abstract]. CARMODY specifies that additives comprise plasticizers employed in amounts of from 0.02 to 5 % by weight of the polymer [col.4, lines 13-20]. At the time of invention, it would have been obvious to one of ordinary skill in the art to use the teaching composition comprising of plasticizer additives as taught by CARMODY et al. the process as taught by modified BIGILIONE et al. in order to strongly bind, adhere and incorporate the blowing agent into the polymer melt by using plasticizers to ensure formation of styrene granules comprising a high expandability quality used to make articles like seat cushions.

8. Claims 10 -14 are rejected under 35 U.S.C. 103(a) as being unpatentable over BIGILIONE et al. (US 4,606,873) in view of ZIMMERMANN et al. (US 5,112,875) as applied to claims 1-5, 7-9,15 -24 above, and further in view of KNAUS et al. (US 5,605,937).

Modified BIGILIONE teaches of a process for production of expandable granules of thermoplastic polymers like polystyrene as referenced in claim 1.

Regarding claims 10 and 12, modified BIGILIONE is silent to teach that the die head or plate has holes having an L/D ratio of at least 2 (claim 10); and that the die plate has holes having a conical inlet with an inlet angle alpha of less than 180 degree (claim

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12). Regarding claims 11, 13 and 14, modified BIGILIONE is silent to teach the diameter of the holes at the die entrance of the die plate is at least twice as great as the diameter at the die exit (claim 11); die plate has holes having a conical outlet with an outlet angle beta of less than 90 degree (claim 13); and that the die plate has holes having different exit diameters (claim 14).

KNAUS et al. teaches of a process for making moldable thermoplastic polymer foam beads comprising of a thermoplastic polymer, blowing agents and additives wherein the extruder comprises a die head 24 as shown in Figure 1 [Abstract]. As seen in Figure 1, the die head 24 wherein die entrance within die head 24 is greater than the die exit 30 (claim 11: the die entrance of the die plate is at least twice as great as the diameter at the die exit) [Figure 1]. In addition, in Figure 1, the length of the die zone within the die head 24 seems to be greater than the diameter (D) of the die exit 30 (claim 10). Figures 2 and 3 show die heads having conical outlet with an angle of less than 90 degree (claims 12 and 13). As seen in Figures 1-4, extrusion devices comprise die heads with different exit holes with different diameters (claim14).

At the time of invention, it would have been obvious to one of ordinary skill in the art to use the teachings of the die head characteristics as disclosed by KNAUS in the process as taught by BIGILIONE et al. in order to produce different marketable size and shape polystyrene granules from expandable styrene polymers with high degree of expandability due to the use of low level blowing or foaming agents used to make a wide range of articles useful in many applications.

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Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISEDA FELAU whose telephone number is (571)270-5128. The examiner can normally be reached on Monday thru Thursday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Phillip Tucker can be reached on (571)272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LF

/Philip C Tucker/
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